

Relationships between Body Image and Subjective Symptoms of Fatigue, Lifestyle and Dietary Habits of Male University Students

Hiroko Moriwaki*, Yoshie Kamimura **, Hiroko Kashima***
and Noriko Maeoomichi*

*Faculty of Human Culture and Science, Prefectural University of Hiroshima
1-1-71 Ujina-higashi, Minami-ku, Hiroshima 734-8558 Japan

hirokom@pu-hiroshima.ac.jp

**Hijiyama University Junior College

4-1-1 Ushitashin-machi, Higashi-ku, Hiroshima 732-8509 Japan

***Naka Public Health Center, Hiroshima City

4-1-1 Oote-machi, Naka-ku, Hiroshima 730-8586 Japan

[Received September 11, 2009 ; Accepted May 27, 2011]

For the purpose of helping university students achieve a healthy lifestyle, we examined the relationship between body image and subjective symptoms of fatigue, lifestyle, and dietary habits. Self completed questionnaires were distributed to 3,267 male university students in the 1st to 4th years of university. A total of 2,878 valid responses were obtained (the valid response rate was 88.1%). Subjects of the analysis for this study were 1,664 students within normal limits according to Body Mass Index who indicated “I’m fat.” (Overestimating Group) and “I’m normal.” (Matched Group) when questioned about their body image. The Overestimating Group showed a greater number of subjective symptoms of fatigue in the categories of “Feeling of physical deterioration,” “Difficulty concentrating,” and “Lethargy.” The Overestimating Group had a lower number of respondents selecting “Exercise three or more times every week,” and “Have never dieted,” “Live a regulated life,” “Always careful about diet,” compared with the Matched Group. On the other hand, a higher number of respondents in the Overestimating Group selected “Want to improve dietary habits,” which suggests the need to develop dietary education and establish an environment conducive to the improvement of dietary habits. It is also necessary to provide health education that allows individuals to develop a proper body image.

Keywords: overestimating body image, subjective symptoms of fatigue, adolescent males, dietary habits

[School Health Vol.7, 35-43, 2011]

1. Introduction

The National Health Promotion Movement in the 21st Century (Healthy Japan 21) established the goal of increasing the number of individuals who recognize and maintain their proper weight, setting the target value at 90% or more. However, according to the National Health and Nutrition Survey, progress toward the goal stands at only 65.6%. The survey also revealed that individuals who recognize their proper weight account for 60.9%, that those who incorrectly classify themselves as being overweight account for 27.1%, and that those who incorrectly classify themselves as being underweight account for 12.0%. These figures emphasize the need to increase the

number of individuals who accurately estimate their proper weight (The Ministry of Health, Labour and Welfare, 2006).

According to research carried out in Japan, individuals who classify themselves as overweight or within normal limits in spite of being underweight express a desire to lose weight, exhibit decreased bone mass (Wakamoto et al., 2009), poor physical condition (Inoue et al., 1992), fatigue symptoms (Kamezaki et al., 1998; Shigeta et al., 2007; Ikeda, et al., 2008; Osako et al., 2005), and low self-esteem (Ikeda, 2007). It has also been reported that individuals who wish to lose weight exercise, reduce the number and amount of meals, avoid sweets or oily food, and eat more fruits and vegetables, which suggests that

weight is associated with lifestyle and dietary habits (Inoue et al., 1992; Kamezaki et al., 1998; Sugiyama et al., 1999; Takahashi et al., 2002). While much research has been carried out on adolescent females, few studies have focused their attention on adolescent males (Ikeda, 2007; Sugiyama et al., 1999; Takahashi et al., 2002). It has been reported, however, that some adolescent males incorrectly classify themselves as overweight (Urata, et al., 2001; Ueno et al., 2005), a mistaken classification that prompts the desire to lose weight (Yamada et al., 2007; Takahashi et al., 2004; Sugiyama et al., 1999; Takahashi et al., 2002; Fujita et al., 2002).

According to research targeting university students in seven countries in Europe, close to 10% of students incorrectly classify themselves as being overweight, and female students tend to do so to a significantly higher degree than male students (Mikolajczyk et al., 2010). Research comparing university students in 22 countries showed similar results. Although Japanese males have a lower average body-mass index than American and European males, they incorrectly classify themselves as being overweight at a higher frequency than their American and European counterparts, which results in many of them being on a diet (Wardle et al., 2006). Method of weight control varied to include exercise, consumption of fruits and vegetables, reduction in the amount of fast food, sweets, high-calorie food, and food containing fat, reduction in the amount of meals, skipping one meal, etc. (Eaton et al., 2008; Larson et al., 2009).

Many observational studies have reported a correlation between J and U type body-mass index and mortality rate, with a normal body-mass index associated with a lower mortality rate (Tsugane et al., 2002; Yuan et al., 1998). Proper body image, weight control, and fitness are necessary for the maintenance and improvement of health throughout life. University students are going through the stage of becoming independent from parental support, and this is an important phase, in which the development and maintenance of a healthy lifestyle increases the potential for future health.

This study was carried out to examine the relationship among male university student body image, subjective symptoms of fatigue (SSF), lifestyle, and dietary habits with the goal of promoting healthy lifestyles and the improvement and maintenance of life-long health.

2. Methods

2.1. Subjects

A self-administered questionnaire was given to 3,267 male students at University A in Hiroshima during the health check-up period in April 2008. University A does not offer any specialized programs in the health sciences. Nursing staff employed at University A distributed the questionnaire and asked each student to return the response sheet via a collection box set up for the purpose. The objectives of this study and the assurance that all personal information provided by participants would be carefully protected were clearly written in the explanation included with the questionnaire, and students were directed to provide responses based on consent. This study was reviewed and approved by the Hiroshima Prefectural University Ethics Committee. A total of 2,977 response sheets yielded 2,878 valid responses. Response sheets on which few questions were answered were excluded from analysis (valid response rate: 88.1%). We calculated body mass index (BMI) from the height and weight measured during the survey (kg/m^2). With reference to the Obesity Criteria provided by the Japan Society for the Study of Obesity (JASSO) (Matsuzawa, et al., 2000), a BMI of less than 18.5 was defined as “underweight,” a BMI between 18.5 and 25.0 as “within normal limits,” and a BMI of 25.0 or greater as “overweight.” The classifications and responses for lifestyle and dietary habits questionnaire items were cross tabulated for χ^2 test. Two among four items related to lifestyle and six among twelve items related to dietary habits showed significant differences at less than 5%, which suggested differences in lifestyle and dietary habits depending on BMI. Therefore, we extracted 1,664 students who responded “Overweight,” “Slightly overweight,” and “Within normal limits” to the questionnaire item on body image among 2,127 students whose BMIs were “Within normal limits” as the subjects of analysis (**Table 1**) to examine the results in accordance with the objectives described in Introduction.

2.2. Questionnaire Items

The questionnaire items were as follows:

- 1) Student grade;
- 2) Body image: (a) Overweight/ Slightly overweight,

Table 1 BMI and Body Image

BMI	Total n=2,878	Body Image			
		Underweight/ Slightly underweight	Within normal limits	Overweight/ Slightly overweight	I don't know.
Underweight (<18.5)	315 (10.9%)	277 (87.9%)	32 (10.2%)	4 (1.3%)	2 (0.6%)
Within normal limits (18.5≤, <25.0)	2,127 (73.9%)	438 (20.6%)	922 (43.3%)	742 (34.9%)	25 (1.2%)
Overweight (25.0≤)	436 (15.1%)	0 (0.0%)	18 (4.1%)	417 (95.6%)	1 (0.2%)

(b) Within normal limits and (c) Underweight/ Slightly underweight;

3) SSF: Four items for each of six categories, namely “Drowsiness,” “Difficulty concentrating,” “Hypodynamia,” “Feeling of physical deterioration,” “Reduced motivation” and “Lethargy” (see **Table 4**) in reference to the Subjective Fatigue Scale for Young Adults (SFS-Y) (Kobayashi, et al., 2000; Kobayashi, et al., 2002), which gave a total of 24 items. Response options were (a) Present and (b) Absent;

4) Lifestyle: Four items, namely “Exercise three or more times per week,” “Sleep well,” “Live a regulated life,” and “Have normal bowel movements” (see **Table 5**). Response options were (a) Yes and (b) No; and

5) Dietary habits: 14 items such as “Eat breakfast every day,” “Eat a main dish with every meal,” and “Always careful about diet” (see **Table 6**). Response options were (a) Yes and (b) No.

2.3. Classifications and Analytical Methods

We assigned students who incorrectly classified themselves as “Overweight/ Slightly overweight” into an Overestimating Group and students who correctly classified themselves as “Within normal limits” into a Matched Group. SSF were quantified by assigning point values; namely, 1 point for “Present” and 0 points for “Absent.” Total scores were calculated as a summation of sub-scale scores. SSF scores in the Overestimating and Matched Groups were compared by Mann-Whitney test. Using the cross tabulation of body image, SSF, lifestyle and dietary habits, we conducted a χ^2 test. The significance levels of the Mann-Whitney and χ^2 tests were adjusted by the Bonferroni method to correct for problems in multiple tests. Furthermore, in order to examine the correlation among body image, lifestyle, and dietary habits multilaterally, we conducted a multiple logistic regression analysis. It was based on forced

Table 2 Student Grade for the Analysis

Grade	Overestimating (%) ¹⁾	Matched (%) ¹⁾	Total (%) ²⁾
1st	212 (42.6)	286 (57.4)	498 (29.9)
2nd	184 (46.5)	212 (53.5)	396 (23.8)
3rd	172 (45.6)	205 (54.4)	377 (22.7)
4th	174 (44.3)	219 (55.7)	393 (23.6)
Total	742 (44.6)	922 (55.4)	1,664 (100.0)

1) Rate in proportion to the total of each grade

2) Rate in proportion to the all subject students of the analysis

entry using body image as a dependent variable, and lifestyle and dietary habits, and showed a significant difference with body image as the independent variables with adjustment for student grade. Analysis in this study was carried out on SPSS Windows 16.0J, and statistical significance was set at 5%.

3. Results

3.1. Student grade

Table 2 shows the grades of the subject students. Among all subject students of the analysis, 1st year students accounted for 29.9%, 2nd year students accounted for 23.8%, 3rd year students accounted for 22.7% and 4th year students accounted for 23.6%. The Overestimating Group comprised 42.6% for 1st year students, 46.5% for 2nd year students, 45.6% for 3rd year students, and 44.3% for 4th year students, indicating no marked differences by grade.

3.2. Subjective Symptoms of Fatigue

Table 3 shows the correlation between body image and SSF score by group. The Overestimating Group had higher SSF scores in the categories of “Feeling of physical deterioration” ($p<0.01$), “Difficulty concentrating” ($p<0.05$), and “Lethargy” ($p<0.05$) than those in the Matched Group.

Table 4 shows the correlation between body image and SSF between the Overestimating and Matched

Table 3 Correlation between Body Image and SSF Score

Scale	Overestimating ¹⁾	Matched ¹⁾	<i>p</i> value ²⁾
Drowsiness	0.93±1.06	0.79±1.00	0.240
Difficulty concentrating	0.80±1.17	0.64±1.10	0.022 *
Hypodynamia	0.37±0.81	0.30±0.75	1.000
Feeling of physical deterioration	0.53±0.86	0.38±0.77	0.001 **
Reduced motivation	0.39±0.81	0.29±0.72	0.107
Lethargy	0.44±0.86	0.34±0.80	0.048 *

1) Average±Standard deviation

2) Significance level was adjusted by Bonferroni method after Mann-Whitney test.

* $p < 0.05$, ** $p < 0.01$ **Table 4** Correlation between Body Image and SSF

<Scale>	Overestimating	Matched	χ^2 test
Symptoms	n=742	n=922	<i>p</i> value ¹⁾
<Drowsiness>			
Want to make a refreshing change	188 (25.3%)	188 (20.4%)	0.791
Yawn a lot	173 (23.3%)	176 (19.1%)	1.000
Sleepy	248 (33.4%)	272 (29.5%)	1.000
Want to lie down	78 (10.5%)	88 (9.5%)	1.000
<Difficulty concentrating>			
Have no concentration	216 (29.1%)	211 (22.9%)	0.185
Lost the ability to follow anything through	121 (16.3%)	106 (11.5%)	0.215
Lost the ability to think clearly	139 (18.7%)	135 (14.6%)	1.000
Have trouble thinking clearly	120 (16.2%)	139 (15.1%)	1.000
<Hypodynamia>			
Want to sit down	75 (10.1%)	73 (7.9%)	1.000
Do not feel like moving	95 (12.8%)	97 (10.5%)	1.000
Do not want to do anything	62 (8.4%)	61 (6.6%)	1.000
Hard to keep standing	42 (5.7%)	41 (4.4%)	1.000
<Feeling of physical deterioration>			
Have stiff shoulders	122 (16.4%)	82 (8.9%)	<0.001 ***
Have eye strain	147 (19.8%)	134 (14.5%)	0.206
Have a stiff neck	43 (5.8%)	38 (4.1%)	1.000
Have dry eyes	81 (10.9%)	95 (10.3%)	1.000
<Reduced motivation>			
Feel no energy	74 (10.0%)	58 (6.3%)	0.275
Become silent	76 (10.2%)	63 (6.8%)	0.610
Depressed	108 (14.6%)	111 (12.0%)	1.000
Do not feel like talking	32 (4.3%)	33 (3.6%)	1.000
<Lethargy>			
Feel heavy	134 (18.1%)	101 (11.0%)	0.002 **
Heavy feeling in my legs	69 (9.3%)	71 (7.7%)	1.000
Heavy feeling in my arms	28 (3.8%)	29 (3.1%)	1.000
Heavy feeling in whole my body	95 (12.8%)	110 (11.9%)	1.000

1) Significance level was adjusted by Bonferroni method. ** $p < 0.01$, *** $p < 0.001$

Groups. Subjects in the Overestimating Group had a higher rate of “Have stiff shoulders ($p<0.001$)” under “Feeling of physical deterioration” and “Feel heavy ($p<0.001$)” under “Lethargy” than those in the Matched Group did.

3.3. Lifestyles & Dietary Habits

Table 5 shows the correlation between body image and lifestyle habits. The Overestimating Group showed a lower rate of “Exercise three or more times per week ($p<0.001$),” “Live a regulated life ($p<0.001$)” and “Have normal bowel movements ($p<0.05$)” than the Matched Group.

Table 6 shows the correlation between the body image and dietary habits. The Overestimating Group showed a lower rate of “Have never dieted ($p<0.001$),” “Always careful about diet ($p<0.01$)” and “Have good dietary habits ($p<0.01$)” than the Matched Group. Meanwhile, the Overestimating

Group had more subjects who “Want to improve dietary habits ($p<0.001$)” than the Matched Group.

Using body image as the dependent variable and using seven items in lifestyles and dietary habits that showed significant differences from body image as explanatory variables, and adjusting student grade, we conducted multiple logistic regression analysis through forced entry. The results are shown in **Table 7**. The Overestimating Group showed a lower rate of “Exercise three or more times per week (odds ratio: 0.67, 95% confidence interval: 0.54-0.82),” “Have never dieted (odds ratio: 0.34, 95% confidence interval: 0.24-0.46),” “Live a regulated life (odds ratio: 0.63, 95% confidence interval: 0.46-0.85),” and “Always careful about diet (odds ratio: 0.66, 95% confidence interval: 0.46-0.93) than the Matched Group, and the Overestimating Group showed a higher rate of “Want to improve dietary habits (odds ratio: 1.57, 95% confidence interval: 1.26-1.95)” than the Matched Group.

Table 5 Correlation between Body Image and Lifestyles

Items	Overestimating n=742	Matched n=922	χ^2 test <i>p value</i> ¹⁾
Exercise three or more times per week	282 (38.4%)	462 (50.5%)	<0.001 ***
Sleep well	164 (22.1%)	262 (28.4%)	0.162
Live a regulated life	88 (11.9%)	200 (21.8%)	<0.001 ***
Have normal bowel movements	410 (55.3%)	586 (63.8%)	0.023 *

1) Significance level was adjusted by Bonferroni method. * $p<0.05$, *** $p<0.001$

Table 6 Correlation between Body Image and Dietary Habits

Items	Overestimating n=742	Matched n=922	χ^2 test <i>p value</i> ¹⁾
Eat breakfast every day.	354 (47.7%)	482 (52.3%)	1.000
Eat lunch every day.	592 (79.9%)	775 (84.1%)	1.000
Eat dinner every night.	709 (95.8%)	891 (96.7%)	1.000
Eat a staple food with every meal.	665 (89.6%)	846 (92.0%)	1.000
Eat a main dish with every meal.	494 (66.6%)	615 (66.9%)	1.000
Eat a side dish with every meal.	352 (47.4%)	462 (50.3%)	1.000
Have never dieted	596 (80.6%)	847 (92.0%)	<0.001 ***
Cook by myself	288 (38.9%)	404 (43.9%)	1.000
Not picky about food	289 (39.1%)	428 (46.6%)	0.103
Do not eat until full	69 (9.3%)	120 (13.1%)	0.855
Always careful about diet	71 (9.6%)	145 (15.8%)	0.010 **
Know the appropriate types of food and amount for meals	111 (15.0%)	186 (20.2%)	0.312
Have good dietary habits	105 (14.2%)	223 (24.3%)	0.010 **
Want to improve dietary habits	503 (68.0%)	523 (56.8%)	<0.001 ***

1) Significance level was adjusted by Bonferroni method. ** $p<0.01$, *** $p<0.001$

Table 7 Results of Multiple Logistic Regression Analysis regarding Body Image, Lifestyles and Dietary Life

	Odds Ratio	(95% Confidence interval)	<i>p</i> value
Exercise three or more times per week	0.67	(0.54-0.82)	<0.001 ***
Live a regulated life	0.63	(0.46-0.85)	0.003 **
Have normal bowel movements	0.85	(0.68-1.05)	0.122
Have never dieted	0.34	(0.24-0.46)	<0.001 ***
Always careful about diet	0.66	(0.46-0.93)	0.019 *
Have good dietary habits	0.78	(0.59-1.04)	0.086
Want to improve dietary habits	1.57	(1.26-1.95)	<0.001 ***

The figures are calculated based on the "Matched Group" for body image. Grades are already adjusted.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

4. Discussion

4.1. Current Status of Body Image

This study was carried out for the purpose of clarifying the correlation between male university student body image and SSF, lifestyle, and dietary habits by body image in Overestimating and Matched Groups to increase our knowledge in this area.

Among the subjects of this study, those who considered themselves to be "overweight or slightly overweight" accounted for 34.9%, and those who considered themselves as within normal limits accounted for 43.3% (**Table 1**). Another study conducted on male university students (Urata, 2001) showed similar results; namely, 38.2% and 38.7%, respectively.

4.2. Correlation between body image and SSF, Lifestyle, and Dietary Habits

The Overestimating Group showed higher SSF scores for "Feeling of physical deterioration," "Difficulty concentrating," and "Lethargy" than the Matched Group (**Table 3**). Studies targeting male university students have reported that incorrect body image led to the desire to lose weight (Yamada et al., 2007; Takahashi et al., 2004; Wardle et al., 2006), and that individuals with a desire to lose weight were interested in dietary habits for weight loss, but experienced repeated unhealthy dietary cycles (Yamada et al., 2007; Eaton et al., 2008; Larson et al., 2009). In addition, those with greater numbers of SSF had lower intakes of calcium, iron, and vitamins,

prompting the authors to suggest this had an impact on SSF (Sannomaru et al., 2004).

According to studies targeting female university students, compared with those who considered their body image as within normal limits, those who incorrectly considered themselves to be overweight had a greater number of SSF. Osako et al. (2005) assumed that this incorrect body image led to the desire to lose weight and dietary restrictions that resulted in a lack of the required nutrition. Ikeda et al. (2008) reported that individuals with a desire to lose weight sacrificed good dietary habits and had a greater number of SSF. Inoue et al. (1992) reported that the individuals who have a desire to lose weight and go on a diet have a greater feeling of reconditioning.

This study also showed that the Overestimating Group included more individuals who had dieted in the past (**Table 6 & 7**). Fewer individuals in the Overestimating Group indicated that they "Have good dietary habits" or that they were "Always careful about diet" (**Table 6**), suggesting the possibility that unhealthy dietary habits may have resulted in a lack of the required nutrition and a greater number of SSF.

The Overestimating Group had fewer individuals indicating that they "Exercise three or more times per week" (**Table 5 & 7**). One study on male university students showed a higher rate of SSF among students that reported no habit of exercising, suggesting that exercise habits help to maintain basic physical fitness and lead to quick recovery from fatigue (Sannomaru et al., 2004). A study on female university students by Osako et al. (2005) revealed fewer individuals in the Overestimating Group who "Exercise three or more times per week" and a greater number of SSF.

This is a cross-sectional study, which cannot prove causal correlation; however, the study suggests that the lower number of individuals who “Exercise three or more times per week,” “Live a regulated life,” “Have never dieted,” and who are “Always careful about diet” among those who have an incorrect body image, may have increased the rate of SSF in the categories of “Feeling of physical deterioration,” “Difficulty concentrating,” and “Lethargy.”

4.3. Need for Healthcare Education

The Overestimating Group had fewer individuals who were “Always careful about their diet,” and “Have good dietary habits” than the Matched Group. However, there were many individuals who were interested in the improvement of their dietary habits in the Overestimating Group (Table 6 & 7). Therefore, providing dietary education to those who are interested in the improvement of their dietary habits may have a beneficial effect. At the same time, it is necessary to provide dietary education to those who are not interested in the improvement of their dietary habits to increase awareness. According to the transtheoretical model (Prochaska et al., 1997), it is desirable to change approaches in response to the phase in which the subject currently is, which shows the necessity of dietary education according to such phases. To promote practice of what is learned through dietary education, it is also necessary to improve the dietary environment, including the provision of information on diet and the development of school cafeterias.

Furthermore, the Overestimating Group had fewer subjects who had not dieted than the Matched Group (Table 6 & 7). In other words, the Overestimating Group has more subjects who are on a diet as a result of incorrect body image, such as considering themselves overweight. This suggests the need for healthcare education that facilitates the development of accurate body image (Yamada et al., 2007; Takahashi et al., 2004). According to a study on adolescents, in spite of the fact that there are many individuals in this group that ask for advice on body image, they often consult with families and friends rather than with specialists. This highlights the need to provide individual consultation in addition to education given to groups (Khor et al., 2009). We consider it very important to provide healthcare education that includes dietary education at

universities not only to promote healthy school lives, but also to promote health throughout life.

This is a cross-sectional study targeting students at one university. The validity of the questionnaire items needs to be established by increasing the subject universities and conducting a longitudinal study. Although this study targeted those who considered themselves to be “overweight or slightly overweight” and “within normal limits” among those whose BMIs were within a normal range, incorrect body image occurred in those whose BMIs were within a range of “underweight” and “overweight,” and there were individuals who underestimate as well as overestimate their weight. Therefore, it is necessary to include such individuals in the study for further examination. It is also necessary to carry out research on the methods of dietary and healthcare education for those who were not interested in the improvement of their dietary habits to facilitate the proper recognition of body image.

5. Conclusion

For the purpose of promoting healthy lifestyles for male university students, we examined the correlation among SSF, lifestyle, and dietary habits. Students were classified into an Overestimating Group, students whose body image was inaccurate, and a Matched Group, students whose body image was accurate. The Overestimating Group showed a greater number of SSF in the categories of “Feeling of physical deterioration,” “Difficulty concentrating,” and “Lethargy,” while there were few in the Overestimating Group who “Exercise three or more times per week,” “Have never dieted,” “Always careful about their diet,” and “Live a regulated life.” However, the Overestimating Group showed a higher rate of individuals who “Want to improve dietary habits,” which suggested the need for dietary education and environment as well as the provision of healthcare education for the more accurate gauging of body image.

Acknowledgements

We would like to express our deep appreciation for the cooperation of students and staff at University A that made this study possible. We would also like to express our appreciation to Ms. Tomoe Kaneko, Prefectural University of Hiroshima, who was involved in data collection for this study.

References

- Eaton DK., Kann L., Kinchen S., et al. (2008) Youth risk behavior surveillance--United States, 2007. *MMWR Surveill Summ.*, 57: 1-131.
- Fujita, Y., Suzuki, S., Kuriwa, M., et al. (2002) A study on the body image of adolescent boys. *Adolescentology*, 20: 363-370.
- Ikeda, J., Fukuda, S., Murakami, T., et al. (2008) Desire for slenderness in adolescent women: transition during 14 years in dietetic students of a junior college. *Jap. J. Pub. Health*, 55: 777-785. (in Japanese)
- Ikeda, K. (2007) Between the slimness orientation among early adolescent boys self-respect and form. *Bulletin of Niigata Seiryō University*, 7: 63-71. (in Japanese with English abstract)
- Inoue, C., Maruya, N., Ohta, M., et al. (1992) Desire for slenderness and actual state of dieting of high school and junior college girls. *Jpn. J. Nutr. Diet.*, 50: 355-364. (in Japanese with English abstract)
- Kamezaki, S., Iwai, N. (1998) Relationship between a desire about body weight, dieting and subjective symptoms among female college students. *Jpn. J. Nutr. Diet.*, 56: 347-358. (in Japanese)
- Khor GL., Zalilah MS., Phan YY., et al. (2009) Perceptions of body image among Malaysian male and female adolescents. *Singapore Med. J.*, 50: 303-311.
- Kobayashi, H., Demura, S., Goshi, F., et al. (2000) Construction of a subjective fatigue scale for adolescent students. *Jap. J. Pub. Health*, 47: 638-646. (in Japanese with English abstract)
- Kobayashi, H., Demura, S., Ouchi, T. (2002) Effective rating of the subjective symptoms of fatigue scale for young adults. *Jpn. J. School Health*, 44: 131-138. (in Japanese with English abstract)
- Larson NI., Neumark-Sztainer D., Story M. (2009) Weight control behaviors and dietary intake among adolescents and young adults: longitudinal findings from Project EAT. *J. Am. Diet. Assoc.*, 109: 1869-1877.
- Matsuzawa, Y., Inoue, S., Ikeda, Y., et al. (2000) New assessment of obesity and criteria of obesity. *Himankenkyū (J. Jpn. Soc. Atud. Obesity)*, 6: 18-28. (in Japanese)
- Mikolajczyk RT., Maxwell AE., El Ansari W., et al. (2010) Relationship between perceived body weight and body mass index based on self-reported height and weight among university students: a cross-sectional study in seven European countries. *BMC Public Health*, 10: 40-63.
- Osako, M., Takayama, S., Kira, S. (2005) Dietary habits, attitudes toward weight control, and subjective symptoms of fatigue in young women in Japan. *Jap. J. Pub. Health*, 52: 387-398. (in Japanese with English abstract)
- Prochaska, JO., Velicer WF. (1997) The transtheoretical model of health behavior change. *Am. J. Health Promot.*, 12: 38-48.
- Sannomaru, Y., Matsubara, S., Muto, K. (2004) A Study for subjective symptoms of fatigue relating the life styles and diets of male university students. *Journal of the Faculty of Nursing and Nutrition Siebold Univ. of Nagasaki*, 4: 11-21. (in Japanese with English abstract)
- Shigeta, K., Sasada, Y., Suzuki, K., et al. (2007) Effects of dieting tendency on the eating behavior and fatigue in young women. *J. Integr. Stud. Diet. Habits*, 18: 164-171. (in Japanese with English abstract)
- Sugiyama, F., Shibuya, S., Hirokawa, R., et al. (1999) Research on health life in Tokai University students: Part 1 Relationships between percent body fat and body perception & lifestyle. *Bull. Faculty of Physical Education, Tokai Univ.*, 29: 1-8. (in Japanese with English abstract)
- Takahashi, H., Kawabata, T., Yamada, S., et al. (2004) Perception and misconception about one's own physique of high school, vocational school and university male students desiring weight loss. *Bull. Sch. Hlth. Sci. Sapporo Med. Univ.*, 7: 23-29. (in Japanese with English abstract)
- Takahashi, H., Yamada, S., Ohyanagi, T., et al. (2002) Body image and dietary habits in adolescent males and females desiring weight loss. *Bull. Sch. Hlth. Sci. Sapporo Med. Univ.*, 5: 9-17. (in Japanese with English abstract)
- Tsugane S., Sasaki S., Tsubono Y. (2002) Under- and overweight impact on mortality among middle-aged Japanese men and women: a 10-y follow-up of JPHC study cohort I. *Int. J. Obes.*, 26:529-537.
- The Ministry of Health, Labour and Welfare (2006) *The National Health and Nutrition Survey (p.186, supplement p.28)*. Tokyo: Dai-ichi Shuppan. (in Japanese with English abstract)
- Ueno, T., Yamamoto, A., Shimada, N., et al. (2005) A comparison between Japanese male and female students of the Kyushu area based on an investigation concerning body shape consciousness. *J. Home Economics of Jpn.*, 56: 369-378. (in Japanese with English abstract)
- Urata, H., Fukuyama, Y., Tahara, Y. (2001) Physique and its recognition in male students. *Jpn. J. School Health*, 43: 275-284. (in Japanese with English abstract)
- Wakamoto, Y., and Nakanishi, Y. (2009) Factors related to the osteo sono-assessment index (OSI) in female college students: effective nutrition and health education plan for women's QOL improvement. *Jpn. J. Nutr. Diet.*, 67: 65-75. (in Japanese with English abstract)
- Wardle J., Haase AM., Steptoe A. (2006) Body image and weight control in young adults: international comparisons in university students from 22 countries. *Int. J. Obes.*, 30: 644-651.
- Yamada, K., Takahashi, H., Miyashita, Y., et al. (2007) Misconceptions about self-evaluated physique and interest in shape and weight control/loss behaviors in adolescent males desiring weight loss. *School Health*, 3: 30-38.
- Yuan, J. M., Ross, R. K., Gao, Y. T., et al. (1998) Body weight and mortality: a prospective evaluation in a cohort of middle-aged men in Shanghai, China. *Int. J. Epidemiol.*, 27: 824-832.



Name:
Hiroko Moriwaki

Affiliation:
Faculty of Human Culture and Science,
Prefectural University of Hiroshima

Address:

1-1-71 Ujina-higashi, Minami-ku, Hiroshima 734-8558 Japan

Brief Biographical History:

2005-2008 Doctor Program, Graduate School of Health Sciences,
University of Hiroshima

2007- Research Associate, Prefectural University of Hiroshima

Main Works:

- Awareness of the dietary choice and lifestyle of elementary school children by those responsible for cooking, *The Japanese Journal of Nutrition and Dietetics*, 64(2), 87-96 (2006)
- Relationship of the health condition, daily living habits, and diet of female university students with their mealtime conversation at elementary school, *Journal of Home Economics of Japan*, 58(6), 327-336 (2007)
- Relationship of children of 3 years to their guardian's dietary life and the frequency of co-eating, *Journal for the Integrated Study of Dietary Habits*, 20(1), 11-16 (2009)
- Providing health meals in university cafeterias, *Journal of Cookery Science of Japan*, 43(6), 359-365 (2010)

Membership in Learned Societies:

- The Japanese Society of Nutrition and Dietetics
 - The Japanese Society of Home Economics
 - The Japan Association for the Integrated Study of Dietary Habits
-